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CONTENTS

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Depreciation

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(Before Montreal Chapter, March 21, 1929)

WHEN a past president of your Society, Mr. Carswell, buttonholed me early last fall, in the neighbourhood of his office down on Shearer Street, to address the Montreal Chapter, I assented without giving much thought to what I could say that might be of interest to you.

Later on when I was approached by your Programme Committee for a suitable date and subject I had to get down to cases. Hence I fell back on "Depreciation" as something about which I might claim to know as much as the next person. Thinking it over since then, I have come to the further conclusion that being an Irishman I like highly controversial subjects. Looking over my morgue of references, I find reams of material written or uttered by financiers, promoters, accountants, engineers, economists, lawyers, professors, judges, capitalists, labour leaders and laymen. It seems as if everybody had ideas on the subject and wanted to tell the world about them.

Obviously so many people having something to say on one subject means that it is one which has an interest for everybody, and which affects everybody in greater or less measure, but about which unfortunately few agree. Furthermore, so many diverse people discussing the subject means that it has many different implications or meanings. I think it was Mr. Coverdale, President of Canada Steamships Company, who at your annual dinner last fall, made some pointed remarks about the depreciation policies of corporations and the humour of company reports. There was more truth than jest in his remarks if one is to judge from the recently issued reports and statements of corporations who should know better.

A Regular Charge

Apparently when profits are small, provision for depreciation must be curtailed although depreciation does not stop. No sound accountant would permit of transferring current expenses to suspense account pending the improvement of the commercial circumstances of his employer or client. Depreciation expense is as sure and as current an expense as wages or consumable supplies. Yet how often do we see the statement "net earnings available for interest and depreciation." Bond holders who in addition to being interested in the continuity of their income should see to it that the security behind their principal is not being impaired. If depreciation is a charge or provision after interest, and only if a balance is available therefor, how can their principal be safe?

Recently I noted down the treatments accorded depreciation expense and depreciation reserves in the annual statements of some of our large Canadian producing and utility industries. Some make annual

provision of 1% or less; in one case the total provision had to take care both of depreciation of property and depletion of deposits; others go as high as 3% to 5% per annum. Reserves being buried in the cost of property or of cost of stocks and bonds, mark you, are either not revealed or if shown are not over generous, having regard to the class of industry or its age and growth. The worst offenders are, of course, those industries which have been recently recapitalized and which must bear a fairly stiff burden of annual interest charges as well as show fair amounts available for dividends.

What is Meant by "Depreciation"

Before we get too far or too deep into the subject, assuming that we can get into it, I had better try to define what depreciation may mean. Unfortunately the term is somewhat elastic with a variety of meanings in different situations. I could, of course, bore you by giving the opinions of a number of authorities which I was originally tempted to do. However, all of you who have owned automobiles or radios or other devices or even homes, purchased on the instalment plan or otherwise, have, I think, a pretty clear notion of what depreciation means. When you came to dispose of your car or home you had to take a loss, great or small, depending upon how much use it had seen or how old it was. In common everyday parlance, depreciation means loss in value, deterioration, the using up of property, or capital goods.

I don't think you will disagree with the statement that practically every item of physical property, no matter how well built or maintained, at some time or another ceases to be of use and loses its worth or value. It may be sold or thrown away or abandoned, but no matter how it is disposed of, a loss has been incurred. This loss has been termed depreciation, retirement expense, expired capital outlay, decretion, but they are all the same in intent. Once in a long while a profit is obtained, as in the case of, say, a painting of some famous artist, but these cases are the exceptions that prove the rule. Try and see if you can sell an old machine or a house or a used car at a profit.

The mere fact of use or the passage of time or both means a consumption of value. No one would for a moment argue that the oil and water used and maintenance devoted to keep a machine in operating condition should not be charged to the cost of output of that particular machine. Yet the mere fact of productivity by itself is using up the machine. Yet time and time again depreciation is considered a financial provision to be met at the discretion of the administration, only if and to the extent that finances permit.

Divergent Opinions

While the majority of people agree more or less as to the fact of depreciation, from there on the divergent paths of thought appear. However, if one examines these divergencies carefully, one finds that they are largely due to two points of view, the instantaneous or momentary one, and the continuous one. The former has regard only for the conditions and facts of the moment. It is the point of view of the balance sheet. The latter takes into account both the past and the

future. It has regard for the whole duration of life and of all conditions that may affect durability and service. It is the Income Statement view.

This divergence of viewpoint has given rose to what appear to be two schools of thought on the question of depreciation—which for lack of better terms—I shall call the "Realized Depreciationists" and the "Accrued Depreciationists." Between them there is a gap which is bridged only when property comes to the end of its useful life of service.

The "Realized Depreciationists" say that the only loss in value is that which is visible or can be measured by physical means, such as the degree of wear, the amount of decay, the loss in operating efficiency or apparent productive capacity. They say one can take into account only what is manifest. The possibilities of the future, or past performance, except as measures of wear, tear and decay, are of little interest to them. Life tables are anathema to the "Realized Depreciationists."

Promoters of reorganizations, valuation engineers and appraisers and the legal fraternity trying to get the best possible value for their clients, sellers generally, tend to belong to this school.

The "Accrued Depreciationists" on the other hand taking the long view say that loss in value, in addition to including physical and visibly manifest losses, should also include the invisible losses due to the passage of time and effects of use or service not subject to physical measurement. The "Accrued Depreciationists" maintain that inadequacy and obsolescence are two kinds of depreciation which must be taken into account. They naturally rely largely on statistics of performance and life data.

Financiers of the conservative type, economists, accountants, operating engineers and officials, and buyers generally tend to belong to this school.

Causes of Depreciation

On account of the divergence of viewpoint it might be useful to examine for a moment the causes of depreciation and the argument that one can offset depreciation by means of proper maintenance.

The reaction of property to its environment which results in wear and decay is an accepted cause of depreciation. Such depreciation is said to be physical, due to "rust, rot and use." As far as an individual machine or structure is concerned, practically no one will hold that maintenance or renewal of parts will overcome, though it may delay, physical depreciation. At some time even in the history of a Ford Model T car it can't be economically rebuilt from parts and even the parts may become unavailable.

However, some authorities maintain that in a composite property one can overcome the effects of piecemeal depreciation by the maintenance and replacement of the worn out units. In spite of argument that once a going property has struck its strike such renewals tend to become uniform, statistics have shown in the case of a number of properties whose management maintained this theory, that replacements were not uniform year by year. Furthermore the replacing units are not of the same kind or purpose or cost as the units replaced. If an attempt is made to determine and capitalize the value of the betterment one gets into all sorts of difficulties as bad as, if not worse

than, the so-called difficulties of determining service life. Moreover, there are comparatively few structures or mechanisms in so-called composite properties which are replaced solely on account of wear and tear. Furthermore, there are few structures in favourable geographical or climatic locations which have survived centuries of time or use. Leaving aside for the moment inadequacy and obsolescence, can one think of a large composite property which has been maintained indefinitely by renewal of units or principal parts only? Even railway properties change in characteristics due to the improvement in roadbed, track, bridges and so forth, which as business increases must be enlarged and made of greater capacity. Furthermore, to anyone who has travelled on this continent at least, the picture of abandoned roadbeds, dismantled bridges, gaunt abutments, outworn stations is all too familiar. Some of it in Canada, it is true, is due to our optimistic pre-war railway policy.

Inadequacy and Obsolescence

In our day and generation the most potent kinds of depreciation are inadequacy and obsolescence. Note, I don't call them causes. They are effects which result in loss in value and are, therefore, properly included under the term depreciation. The cause of inadequacy is growth and public demand for more service or products. The cause of obsolescence is invention, new developments, the result of progress, improved standards of living, and demand for better products and more widespread services.

Usually it is neither possible, expedient nor economic to provide plant capacity much in excess of visible demand with a small allowance for growth. However, as communities and markets expand, plants must be correspondingly increased with resulting abandonment of the smaller capacity plant. If inadequacy is not to play its part, the business or organization will have to be put up with the costs of idle or excess capacity plant. The question finally resolves into a balancing of cost of inadequacy against fixed interest charges during the period of growth.

Invention and the cold-blooded research of both public and private organizations are continually bringing to light better and more efficient machines and methods to accomplish a given result. To argue that the cost of obsolescence is a charge to the future and should be met out of the savings derived from the new method or machine is cold comfort to the firm which sees a competitor spring up overnight with the latest machines and methods. If the competitor can produce more cheaply with such new machines, it won't cheapen the original firm's costs to add the cost of amortizing old machines to the costs of production with the latest types. Obsolescence should be provided for before it happens, not after.

The Royal Bank of Canada said in one of their monthly letters last year:

> "The company which fails to make constant replacements quickly finds itself unable to compete with some new competitor with new machinery, new methods and lower cost. It requires perspective and courage to scrap a well built plant which does not happen to be arranged in a manner which permits efficient operation," and "Because of the constant improvement in machinery the

factor of obsolescence plays a larger part in manufacturing than in distribution."

One of the fifteen principles followed by the Ford Motor Company in obtaining low production costs is stated as follows:

Recognize obsolescence. It is more potent than depreciation by wear and tear."

That there is a fallacy in the argument that because the new method or machine will reduce costs, it is therefore good business to absorb the losses incurred in replacing obsolete machinery through the savings thereby obtained, is evidenced by the following:

Last December I had occasion to visit Yarmouth, Nova Scotia, and observed that the local street railway had gone out of business, its rails had been torn up, the copper trolley wire sold to the junk dealer, poles gone, the car barn turned into a tumble down garage, the whole being replaced by a modern bus service. The shareholders of that concern were completely out of luck if the company had not recovered through its revenues and accumulated some kind of a depreciation reserve to meet the loss of its investment in depreciable property. I understood they had a lawsuit on their hands as to who should pay for the cost of repaving the streets when the rails had been removed. Mr. Bus-owner was sitting pretty of course. He was not contributing to the cost of obsolescence. This case is typical of what is happening all over the continent. How do you know it won't happen to your concern?

Inadequacy and obsolescence can't be put off to the future any more than physical depreciation. They should be provided for during the life or usefulness of the existing property. They are the cost of growth and progress. In most industries nowadays they are more important than physical depreciation.

Just at the moment, Montreal would appear to be conspicuous in examples of both inadequacy and obsolescence. Overnight it would appear as if our skyline is changing.

Measurements and Application of Depreciation

Cost accountants, I think, should, if they have not already done so, give this matter of depreciation expense a rather important place in their analysis of costs. It is, of course, not so easy to measure or apply as, say, labour, material or even overhead, of which usually depreciation is considered a component.

Accountants, I know, are called upon to record both kinds of losses, referred to previously when discussing the divergence in viewpoint of the depreciationists. It is relatively simple to account for the loss when it has actually transpired, but sound accounting requires that if a loss is accruing or consumption of wealth taking place with time or use, it should be so accounted for.

To measure and apply depreciation of property three facts must be known or estimated:

First—The cost of the property subject to depreciation.

Second—The loss to be ultimately incurred when the property ceases to be of use. This loss is equal to the cost less any salvage or scrap value.

Third—the period of time, or service life, during which the property will depreciate to its salvage or scrap value, or the volume of production or service the property will be capable of rendering before it ceases to be of use.

Different kinds of property have different reuse or scrap value, and vary in their rates of consumption either with time or use. Hence engineers and accountants tend to classify properties into more or less homogeneous groups depending upon similarities of structure, use and serviceability.

This requirement has brought about the various property classifications in the records of some private corporations and was more or less a fundamental to the classifications prescribed by public authorities for public utilities. Other considerations, of course, had a bearing upon the various well-known classifications. The cost accountant, if he is to record depreciation expense with any approach to accuracy, must make some subdivisions between his long-lived plant, which may be devoted to all processes and products, and shorter lived highly specialized equipment, which may be employed in single processes or for individual products.

Both from the point of view of determination and allocation of depreciation expense, more or less detailed property records are a sine qua non of depreciation accounting. I believe this point has been stressed by a previous speaker addressing this chapter.

I might emphasize that depreciation expense has to do with the cost of property consumed not with the cost of replacements or renewals. Depreciation expense refers to the consumption of property. Whether it is to be replaced or not at the end of its useful life is a question of policy. If the replacing property is more costly, the difference is a betterment to be provided for out of capital funds, not by present customers or users.

In addition to possessing adequate records of plant subject to depreciation, means must be available for reporting and writing off plant no longer serviceable, and the net salvage received therefor. Salvage is not a credit to fixed capital or investment in property, a common accounting error. By net salvage I mean the reuse or scrap value of property retired, less any costs incurred in removing and disposing of the property. Just as much attention must be paid to transactions involving the displacement and abandonment of property as is devoted to accounting for its initial installation. Pyramiding of costs of replacing property on top of costs of abandoned property is not an uncommon practice. Such practices brought into disrepute the investment or fixed capital records of public utilities during the last century and first decade of the present one, and resulted in the rather stringent accounting rules of public regulatory bodies relating to property retirements.

Measurement of Service Life or Productivity

If one has more or less reliable historical records or plant ledgers, as a recent speaker before your chapter has defined them, of property and of output, there are a number of accepted methods of ascertaining average service life or average output. Different methods have different application, depending upon the characteristics of the property, its use and its growth or decline.

By service life is usually meant life in one location or life during which the structure is used by one owner or for one purpose. It is the period of time from installation or erection or acquisition to the time when the structure ceases to be of use in that location or to its owner. Service life frequently is less than physical life or life from the "cradle to the grave." It is usually impractical to keep track of a structure or mechanism from initial erection to the junk pile. The difference between physical life and service life is taken care of by the reuse value at the end of each service life except the last when only scrap value, if any, arises.

"Turnover Cycle" Method

One method of ascertaining service life known as the "Turnover Cycle Method" is depicted in Figure I. It involves the determination of the period of time during which plant has been "turned over," i.e., replaced or built up through annual additions and retirements.

The rising line in figure I., marked "Investment in Plant," has been plotted to show the amount and trend of the total investment in plant at the end of each year. The backward falling line, marked "Accumulated Annual Additions," shows the result of reducing year by year the final investment by the accumulated annual additions until an intersection is made with the base line. The backward rising line, marked "Accumulated Annual Retirements" shows the plotted result of progressively accumulating the retirements year by year until an intersection is made with the "Plant Investment" line. In both cases it will be seen, and it can be demonstrated mathematically, that the points of intersection are equally distant from the line of the final year. This distance or period is defined as the "Turnover Period," and is an indication of the average service life of the class of plant in question. Providing the data are expressed in the same units or on a uniform cost level and there is little growth, the method is highly representative. Where growth as well as replacements occur certain adjustments are necessary. The method is analogous to the method used to measure turnover of stock. For instance, if you had 1,000 machines in service of similar characteristics subject to individual replacement and even growth, and you replaced 200 a year and the whole 1,000 in five years, your indicated average service life would be five years.

This method of ascertaining average service life is probably the simplest where one is dealing with a large number of items of more or less similar characteristics and performance.

"Dollar Year" or "Realized Life Method"

Another method known as the "Dollar Year Method" or "Realized Life Method" can be applied to items such as buildings, blast furnaces and large machines subject to piecemeal extension, replacement and renewal and usually final retirement as a complete structure. The dollar year method involves the ascertainment of the number of years the total dollars or units added year by year on account of a given structure or group of structures have existed either to the time under consideration or to the dates of ultimate retirement.

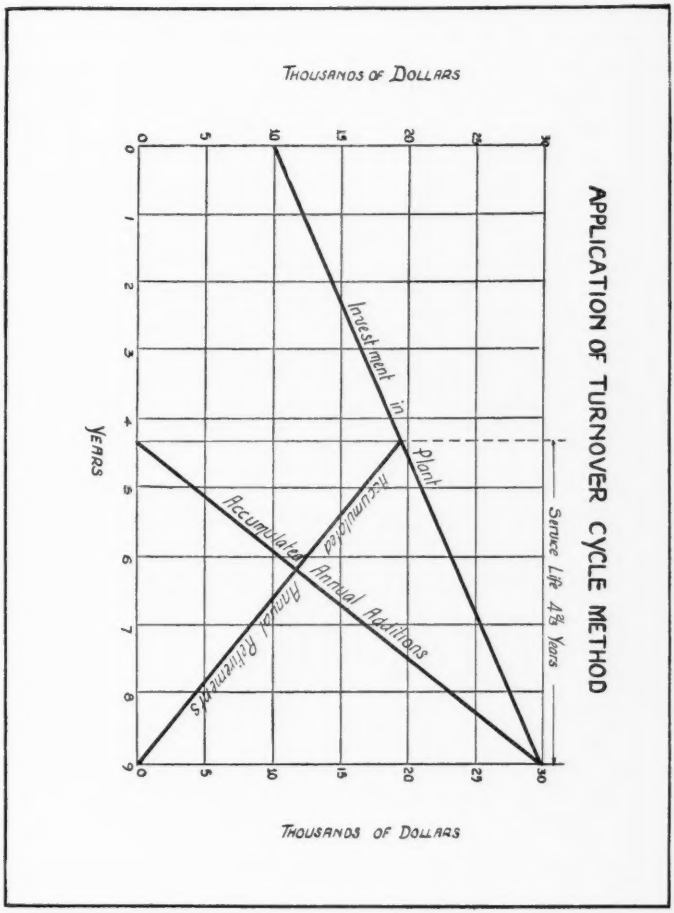

FIGURE 1

For instance, say in the year 1900 we install a machine costing $1,000; five years later, in 1905, we make an extension costing $1,000; and again 3 years later, in 1908, we make a further extension costing again $1,000; and finally, in 1910 we retire the whole machine and its extensions.

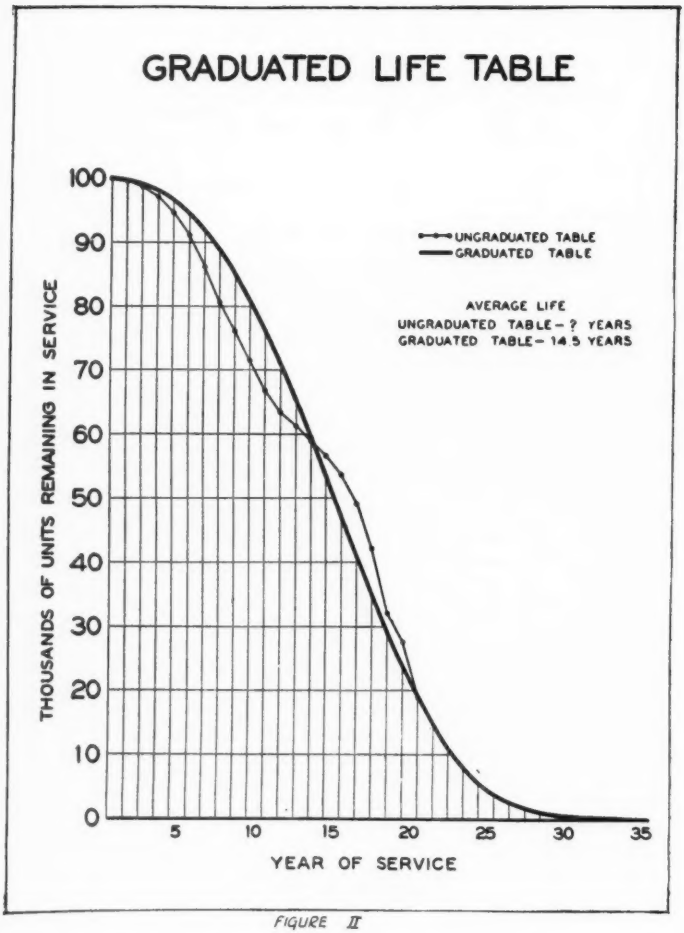

FIGURE II

The original $1,000 had a life of 10 years
and experienced 10,000 dollar years;
first extension of $1,000 had a life of 5 years
and experienced 5,000 dollar years;
second extension of $1,000 had a life of 2 years
and experienced 2,000 dollar years;
total cost of machine and extensions, $3,000, and
experienced 17,000 dollar years and had average life
of 5 2-3 years, not 10 years.

MORTALITY CURVES

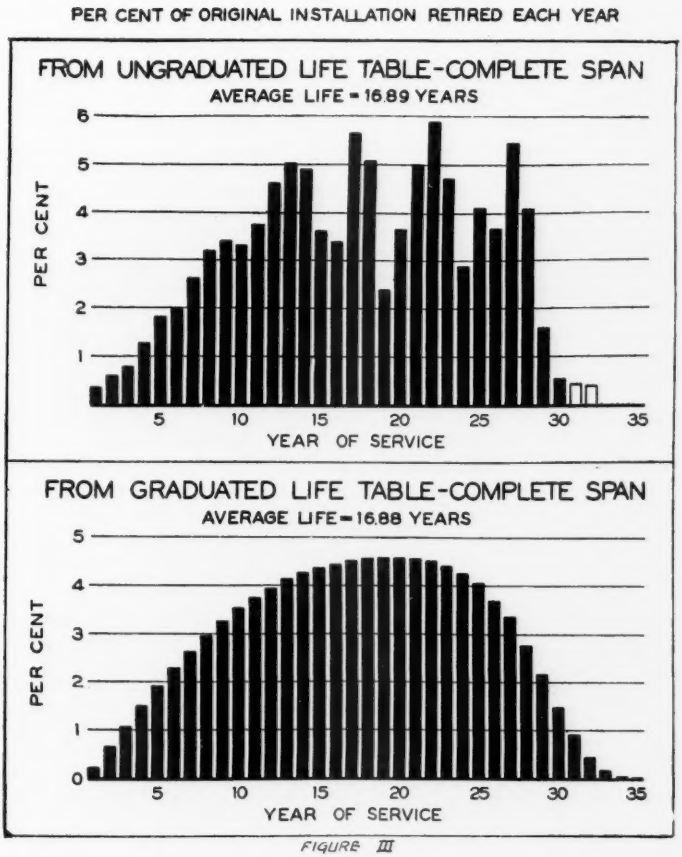

FIGURE III

In cases such as this one, it is true, the effect is to charge off depreciation in advance of occurrence. Otherwise, one would have to increase the rates as each extension or addition was made so as to provide sufficient reserve at the termination of the usefulness of both the structure and all extensions and renewals.

"Life Table" Method

A third method known as the "Life Table Method" has been borrowed from the Life Insurance Actuaries. It involves the determination of the life table or curve representative of the life character-

istics of a class of property. A life table may be defined as a series which indicates the number of units surviving, out of any assumed number of units originally installed, at the beginning of each succeeding year of life. Figures II. and III. respectively are examples of a life table and a mortality curve showing what the original raw or observed data looked like before smoothing or gradution and also the smoothed or graduated curves derived mathematically from the observed data. It is a comparatively simple mathematical process to compute the average service life from a smoothed or graduated life table. The method can be used only for classes of property comprising many similar and relatively simple units which are being put into and taken out of service as individual units. Poles and freight train cars, for example, are two kinds of plant in the public utility field for which life tables have been constructed.

Records of output for individual machines or groups of machines provide a means of estimating or verifying their productivity. From such records, or records of time in service compared with total life, it is possible to work up depreciation costs per unit or per machine hour.

The whole point is that each organization should have available or make available as time and finances permit, data showing their own life or output experience. Average service lives and depreciation rates obtained from tables in blue books or text books are useful but no guide to the particular costs being incurred by any given organization.

Applying Depreciation Expense

There are at least two accepted methods of expressing or applying depreciation expense, each sound in its own field of application and a number of others more or less theoretical. The best known is, of course, the "Straight Line Method," which is based upon the principle that "the cost of using up property should be shared equally by the products or years which had the benefit of use." In other words, the depreciation expense for a given item of property is the same for equal periods of time or equal volumes of production. In equity this is sound, although in fact there may be increasing loss in value due either to physical or functional causes. If the service, other things being equal, is the same in successive equal periods of time or the quality of equal volumes of product the same, there is no valid reason why the later period or later volume should be charged with a greater or lesser amount of depreciation than the earlier one.

The Straight Line Method expresses depreciation expense as a percentage of the cost of the property per period or as a cost per volume.

Thus the rate per cent. per annum would be equal

$$\text{to} \frac{100 \times \text{cost less net salvage}}{\text{service life in years} \times \text{cost.}}$$

and the cost per unit of volume would be equal

$$\text{to} \frac{\text{cost less net salvage}}{\text{over total volume.}}$$

The Straight Line Method is simple of application and involves no question of interest or the effects of retirements of similar items in accordance with some mortality law.

The Sinking Fund Method is also based upon the principle of apportioning equally to equal time periods the amount of depreciation expense, but assumes that the amounts reserved or set aside will be improved by interest accretions, so that at the end of the service life of the property the depreciation accruals, together with interest accretions, will equal the loss culminating upon retirement. In effect an increasing amount each year must be provided from the revenues derived from the use of the property; one portion equal in amount year by year is called depreciation expense, the other increasing annually, interest on the depreciation reserve. The method, while it can be explained and defended on theoretical grounds and has, of course, a field of application, is impractical in ordinary accounting procedure. The very first thing that must be decided is the rate of interest, and very quickly one could get into the contentious ground of "Interest as a Cost."

Furthermore, where we are dealing with a class of plant comprising many relatively simple but otherwise similar units, such as poles or meters or freight train cars which have individual service lives extending over a wide range and whose retirements tend to be in accordance with a so-called mortality law, if it is necessary to combine the effect of interest on the accumulated depreciation reserve with the annual or equal depreciation charges, the effect of the distributed retirements with age must be known and discounted. Such modified Sinking Fund Method I have called the Mortality Annuity Method. I have knowledge of classes of property in an industry whose retirements at different ages are such that the modified sinking fund or mortality annuity rate, computed with 7% interest, is practically the same as the corresponding straight line rate. Furthermore, the Sinking Fund Method is highly impractical when we wish to express depreciation as a function of the amount of use or productivity.

However, in engineering cost studies where the economic advantages or two or more plans of executing a scheme are under investigation, the depreciation rates assumed should be the sinking fund ones with interest equal to the cost of money, and, of course, the necessary correcting factors for net salvage and distributed retirements.

During the early life of an organization it will probably be necessary to make estimates both of the net salvage and the service life or productivity to be expected from a structure or group of machines. These estimates can be modified in the light of experience as revealed by the plant records. Intelligent estimating, subject to verification as experience is gained, is better than no depreciation provision whatsoever or a grab depending upon the available earnings of the business. The cost accountant must find and know his costs before the year's income statement has been drawn off. Costs cannot be complete without the inclusion of an item representing the consumption of plant. Of course, small concerns may find it difficult to secure enough data upon which to base depreciation expense. That is where an organization such as your Society might serve as a collection agency and clearing house of the experience of these small firms. The combined data would serve as the basis for depreciation rates for firms in the same line of business.

Other methods such as the Reducing Balance, Annuity and Unit Cost have been suggested. The Reducing Balance Method, I understand, is one recommended by English authorities. It has the defect of reducing and thus obscuring the original cost of the item depreciated and also results in relatively heavier charges during the early life of a depreciable property than during the later. The other two methods, while theoretically interesting, are of no practical use.

So far I have discussed the measurement and application of depreciation expense from the point of view of the accountant. It will thus be obvious that accountants tend to be "Accrued Depreciationists."

The appraiser or eigineer called upon to make a valuation of property must give his opinion as to the then value. This, then, or current value is usually taken as the cost to reproduce less visible depreciation. Seldom does the appraiser make allowances for inadequacy or obsolescence unless the property is so old or so obviously outgrown that all he can allow is some junk or scrap value. The appraiser usually tries to measure the degree of wear and tear or the remaining serviceability of the property from a physical standpoint. He thus arrives at present condition, which he may express as percentage of cost new. The difference between cost new and present condition value is his measure of the loss in value due to physical depreciation, lack of maintenance and other factors and may or may not take into account scrap or reuse value. This loss in value is seldom if ever the same as the amount that would be reserved as a result of any method of accounting for depreciation. Care should, therefore, be exercised in cases of reorganization or recapitalization before setting up depreciation or other property reserves to ascertain the basis of the appraisers' or engineers' figures.

Financial Burden Due to Replacements

Another bearing of the depreciation question which frequently affects both engineers and accountants is the determination of the financial burden or real cost of replacing an existing serviceable structure by a later, more modern and perhaps larger one. The question might arise in connection with litigation or an expropriation or the desire to secure the removal and replacement in some other location, or for any number of other reasons. The burden is, of course, not the cost of the new structure nor the cost of the old nor the combined cost of both. The existing structure has, of course, rendered considerable service, and although depreciated has both productive capacity and perhaps a present day residual value. An estimate of the financial burden involved in the replacement is usually essential in order to apportion costs as between the owner and the other party desiring the change.

For the sake of illustration, let us assume that the existing structure would cost $12,000 to reproduce; that it would fetch $2,000 if sold now, either as scrap or for reuse elsewhere; that it is 30% depreciated or has rendered 30% of its possible total service, measured on the basis of its elapsed life to total life or realized productivity to total productivity or estimated from physical inspection; and that the new replacing structure would cost $15,000. The realized service value or the worth received from the existing structure is 30% of $12,000 less $2,000 or $3,000. This figure is a measure of the benefit

that has already been derived from the use of the existing structure and has presumably been included as depreciation expense in the past and been lodged to the credit of the depreciation reserve.

The present burden is therefore $10,000, the difference between the $15,000, cost of new structure and the sum of the realized service value, $3,000, and the sale or scrap value of the existing structure $2,000; or more simply—

Cost of new structure		$15,000
Less—Realized Service value—old structure	$3,000	
—Residual or Sale value—old structure	2,000	5,000
Burden		$10,000

This financial burden is thus the amount of new money or capital that must be obtained to replace the existing structure over and above the salvage and amounts of accrued depreciation.

Depreciation or Retirement Reserves

As a result of including depreciation charges in costs of service or production, a depreciation or as it is sometimes called, a retirement reserve will be built up. If the rates and methods of applying them are sound and retirements recorded as they occur, the reserve will never be any greater than is justified by the needs of the business.

The financial effect of depreciation accounting is initially to retain in the business a certain amount of funds which are not needed to meet current expenses. It is customary practice and sound business policy to use such reservations of funds to extend the property and for other company requirements in lieu of raising money through security issues. At the end of the useful life of depreciable property, the net loss then incurred is written out of the investment account into the depreciation reserve and at the same time, if correct accounting has been followed, there will be amongst the assets either in funds, receivables or property, an amount equal to the net loss incurred.

The depreciation reserve is thus a valuation account representing the amount or cost of assets which have been provided out of reserve to offset the eventual retirement of property.

The depreciation reserve is also equal to the aggregate of the depreciation provisions less all charges on account of property retirements. In this respect the depreciation reserve may be looked at as a retrospective one resulting from transactions in the past. On the other hand the depreciation reserve may be looked at from the prospective point of view as measuring the estimated liability for the future retirement of property. In this sense it is analogous to the valuation reserves of life insurance companies. From this point of view, if data as to service lives, net salvage and age distribution of existing plant are available, it is possible either to check or to set up a depreciation reserve on actuarial principles.

It is only by a coincidence that a correct depreciation or retirement reserve set up by any accepted method measures actual loss in value. As stated before neither the straight line nor the sinking fund methods will express the loss in value occurring in property except when one adopts the principle that loss takes place in accordance with the straight line principle. Just because a man pays an equal annual

premium does not necessarily mean that his value decreases annually in that proportion. So while the annual provision for depreciation may be equal in amount every year and from the point of view of consumption of value or equity, this may be quite justifiable, nevertheless few would want to maintain that the property thus depreciated loses value in equal annual decrements.

Hence depreciation reserves do not necessarily express loss in value. Yet how often does one see balance sheets which show the depreciation reserve as a deduction from the cost of property. Such reserves are frequently built up on the basis of expediency, or what the business can stand in the way of depreciation provision. To my mind at least, such reserves certainly do not measure loss in value, and where deducted from the cost of property do not by any means reveal value. The matter is much worse when the depreciation reserve is shown as a deduction from the cost or value of securities of subsidiary companies whose property the reserve is intended to protect.

Depreciation reserves are intended to be used not as ornamental accounts in balance sheets which have a bad habit of growing until they are used as a basis for recapitalization or to meet dividends. As I mentioned before when property is abandoned or otherwise disposed of, suitable entries should be made to reduce the depreciation reserve.

Summing up the above, I would say that the balance in a depreciation reserve does not measure the actual loss in value of property and the amount of deterioration in a property is not an indication of the reserve required to protect that property. Two entirely different things are involved. Hence our two schools of depreciationists.

I could go on to talk about Depreciation and Maintenance, Depreciation Reserves and Sinking Funds, Amortization Reserves, the investment of reserves in interest-bearing securities instead of property and so on. This question has many more interesting bearings. I believe one could talk all night about the relation of depreciation and say income tax.

However, I would conclude by saying—

That depreciation in an enterprise is a fact and is as much an expense of operation as any other expense;

That depreciation accounting is as necessary as accounting for any class of transaction;

That correct depreciation accounting will result in—

(a) Each accounting period or class of product carrying its own share of the cost of property consumed therein.

(b) The creation of reserves which will take care of property losses as they occur.

(c) The retention and investment in the enterprise of funds representing the cost of property consumed, in new property the cost of which will equal the losses incurred when property is ultimately retired. In this case I assume of course the continuity of the enterprise. Otherwise such funds should eventually be paid back to investors as a return of their capital.

All capital expenditures are deferred charges to operations as all property and equipment is on the irresistible march to the junk pile.

The General Scope of Cost Accounting

By J. G. MUNDIE, C.A.,
Riddell, Stead, Graham & Hutchison, Winnipeg

(Before Winnipeg Chapter, February 18, 1929)

I THINK it will be generally conceded that possibly the most essential information for the manufacturer of to-day to know about his business is what it costs to manufacture his goods. Perhaps never before than in recent years has competition been so keen and therefore true, cost finding has become an absolute necessity in a business of any size or importance. The day of the "rule of thumb" method has gone into the discard, and is lost, let us hope, beyond recall.

The chief end of any business, in fact its raison d'etre is to make money, and that can only be accomplished if the goods manufactured are sold for more than they cost. The ascertaining of cost then is the first essential and it is with this feature of accounts that as Cost Accountants are more closely concerned. If we members of this Society can do anything, however small, towards assisting the Manufacturers of Western Canada in this connection we will have more than justified our existence.

It is my intention, therefore, this evening to deal more particularly with Factory Cost Accounting, which is perhaps the most important, although the principles are equally applicable to any business. In the limited time at my disposal it will, of course, only be possible to deal with the broad principles of costing and touch briefly on its functions and the elements of Cost.

Costs and Management

Nowadays businesses are being run more and more on scientific lines. In order that the management may guide the affairs of any business it is essential that he have all the facts. These facts should be laid in front of him in such a way that he can put his finger on any weak spots which may have developed. He should be able to tell from them if there is too much idle time, too much waste material or too much defective work. They should tell him what articles are profitable and which are not. They should furnish him with the information essential for the preparation of financial statements such as the Balance Sheet and Profit and Loss. They should provide him with the data on which he can base the selling price of his goods. These facts can only be supplied by a proper Cost System.

It will be readily understood that the installation of any such system is not an easy matter and requires careful consideration and study. The whole plant and organization must be carefully gone over and viewed from every angle before the foundation is laid. Particular care should be given to the Wages and Stores system in force, as it is of primary importance that these elements of cost are accurately recorded. Cognizance must be taken of the Financial Accounting

system, as the two systems must dovetail. If they do not then it is impossible to tell whether the cost records are correct or not. It must not, of course, be expected that any system when first installed will commence to give its best results right away. Changes will undoubtedly be necessary as time goes on, and any system should be elastic enough to be readily adaptable to changing conditions.

Nicholson, who is one of the recognized authorities on costs, gives the following advantages to be derived from a Cost system.

(1) A perpetual inventory of all classes of goods and materials can be maintained which provides a means of discovering or determining.
   (a) Losses of Materials.
   (b) Obsolete Stock.
   (c) Insurance requirements for the merchandise in the various departments of the plant.
   (d) Information for the purchasing department as to quantities on hand and the necessary requirements.
   (e) The correct quantities of product which must be manufactured in order to maintain stock requirements.
   (f) Information for the sales department as to deliveries on orders.

(2) The costs of each article, class of product or operation being separately shown, the management has the necessary data on hand to guide it in making changes of policy.

(3) Costs for different periods and under different conditions are obtainable and comparable.

(4) The records provide for following the material from the raw state until it becomes finished product and for ascertaining the time, labour and expense involved in its manufacture, and in this way deficiencies may be detected.

(5) A Cost System supplies the information necessary for standardizing the work of a plant which might include:—
   (a) Ascertaining the unit of production upon which the various departments may operate efficiently, thereby keeping the various operating departments balanced with each other.
   (b) Changing day-work operations to piece-work operations or perhaps to the premium or bonus system of paying wages.
   (c) Establishing a basis for a planning or routing system of orders in the various departments.

Any system which is installed, therefore, should have as its aim the obtaining of much, if not all, of the information just mentioned.

Elements of Cost

There are three elements of Cost—wages and materials, usually known as prime cost—and overhead on cost or burden, whichever term you may care to use. The term Cost is occasionally used somewhat loosely, and to avoid misunderstanding it is well to bear in mind that there are several kinds of cost. There is Prime Cost re Labour and Material, Factory Cost, which is prime cost, plus Factory Overhead, and selling or total cost, which is factory cost plus administration and

selling expenses. Adding profit to total cost gives you the price at which the goods can be sold.

Generally speaking, the elements of prime cost are not difficult to ascertain in total, but without a proper system their application along the proper channels is not so easy.

Wages

What information regarding wages is necessary for the proper functioning of a cost system?

(1) The actual time worked by each man must be properly recorded.
(2) The proper job or jobs must be charged with the time spent on them by each man.
(3) There must be proper supervision of the rates.

There are, of course, other essentials for the conduct of an efficient wage system, and I have only mentioned these three points as an example of the information required. Of course, no one method of paying wages is suitable for all businesses. Conditions are such as to render this impossible, but care should be taken to use the system which is most suitable for the business concerned.

The main systems of paying wages are:—

(1) Hourly Rate.
(2) Piece Work.
(3) Bonus System.
(4) Premium System.

No. 1 is perhaps the most common method, and under it the workman gets a fixed rate of pay for each hour worked, or it may be so much a day, consisting of a certain number of hours. It does not readily lend to proper cost finding, although it may be fairly accurate in the case of indirect labour. Because of the human element it will be seen that although the rate of wages may remain the same, the Labour Cost of an article may vary from day to day.

In piece work a man is paid for the amount of work he does, and this method is, therefore, an incentive to increase production, as the more a man produces the more he will earn. The important point to be considered is the rate per hour, which must be very carefully studied.

The premium system is somewhat like piece work, only it is based on the time saved and not on the quantity produced; any time saved on operations being paid at a higher rate.

The bonus system is along the lines of the premium system, under which a man gets a daily wage plus a piece rate on each unit in excess of a specified minimum.

Other methods are, of course, in use, but they are for the most part elaborations or modifications of the foregoing.

The determination of the direct labour cost under any wages system is a comparatively simple matter, and there is no reason why it should not be accurate. With the actual machinery in operation for the recording of the employee's time, i.e., by time-clock, brass check, etc., we are not particularly concerned from a cost point of view. It is the distribution of that time which is all important, and that is a function which can only be undertaken by some one in authority who

is familiar with the department or the factory. Each day's slips must be prepared showing the time worked by each man on each job, order, department, etc., and from these a summary is prepared allocating the time, which must agree with the total payroll. This summary forms the basis of the distribution of wages to the various jobs, orders, departments, etc., by the cost department.

Stores

The proper distribution of stores is not quite so simple as that of wages, as there are one or two complications in regard to the former which are not met with in the latter.

First, there is fluctuation of price, which in some businesses is quite considerable, and might make a material difference in the cost. The most common way of overcoming this difficulty is by ascertaining the average cost of all material and charging out all issues at that price. The more correct way would be, of course, to so earmark each lot of material that it could be issued at its exact cost, but this calls for very careful handling of stores, and very often is not either possible or practicable.

Next, there is loss of weight. Certain classes of stores, owing to atmospheric conditions, lose weight while in stock, and allowance must be made for this loss when issues are made. Under these circumstances the materials issued are priced at the cost after the shrinkage has been allowed for, e.g., if an article costs, say, $10.00 a 100 lbs. and it loses 10 lbs. while in stock the issue price would be not 10 cents a lb. but 11 1-9 cents.

Each requisition to the storekeeper for materials should be made by someone in authority—usually the superintendent or foreman—and on it should be stated the date, the quantity, class of material and its destination. There will also be a money column to be filled in by the storekeeper. From time to time all requisitions are listed according to jobs, orders, departments, etc., and sent to the Cost Department for record in the proper accounts.

I have dealt with the Stores requisitions—and for that matter, wages also, very briefly, as I feel that most of you from practical experience are more familiar with these features of the operations than I am.

Before passing from Stores it might be as well to consider for a moment the question of scrap, as the correct disposition of scrap is one of the difficulties in accurate costing. If the scrap is of such quantity as to materially affect the final cost, then to my mind it should be deducted from the material cost of the job, order, etc., on which it applies. If, however, the scrap is inconsiderable then the price realized therefrom can well be taken in the Accounts as Sundry Income and used to reduce overhead expenses. In cases where scrap is used for the manufacture of by-products, its original cost should be ascertained and either deducted from the material cost of the original article or in certain instances credited to the goods in process of that article.

Factory Overhead

Now we come to the more difficult question of the distribution of expense, which is the bugbear of costing, and regarding which there are many differences of method and opinion. I may say that at the

best whichever method is adopted it can only be an estimate, very accurate it is true, but still only an estimate. I need not deal with the various methods of collecting the monthly expenses as they are no doubt familiar to you all, only differing with the requirements of each class of business.

From the Payroll and Stores distribution, such items as Indirect Labour, Superintendence, Inspection and Indirect Material, Supplies, etc., will already have been obtained and charged to the departments concerned. There are certain expenses which are not so readily applicable and a brief summary of the principal items and the methods of apportioning them may be interesting.

Power, Light and Heat:

It is not always possible to separate the charges under the above heading, and as they are of a similar nature they can be considered as one. The meter readings and the horse power of the machines, in conjunction with the space occupied form the basis of the charge to departments in respect of these items.

Insurance—Fire and Liability:

Insurance on stocks and equipment can be distributed on the basis of the values of these items in each department with a distribution of the building insurance, say, on space occupied. Liability insurance would be charged to departments on the basis of departmental wages.

Real Estate Taxes:

These should be distributed on the basis of space occupied.

Rent:

The charging of rent of a factory as part of cost is debatable. I look upon it in this way. If the factory is owned by the company, then there should be no argument as to the legitimacy of charging taxes, insurance and depreciation on the building into costs. In the case of a rented building it should be quite proper then to include a similar charge, eliminating what might be called the proprietor's net return on his investment. This latter item is, of course, impossible for the tenant to compute so that perforce he has to use the total rental charge.

Repairs and Maintenance:

The above item should be capable of being distributed to departments at the source, i.e., store requisitions, purchase invoice, cash purchase, etc.

Depreciation:

This is one of the most important items of overhead, although once the amount is arrived at it is very easy to allocate. I do not propose to deal with the various rates of depreciation, as these can only be based on the circumstances of each case. Depreciation is, of course, based on normal production and any departure therefrom would call for a reconsideration of the rate to be charged. Special machinery also requires careful consideration of its nature before deciding on the depreciation to be allowed. (D.B. Co.)

Interest:

I haven't mentioned that most controversial of all items—interest, the arguments for its inclusion in cost being only equalled by the arguments against it. From my own personal viewpoint, I would just say that as a C.A. I would not view with any great favour the inventory of a client which included interest as a manufacturing cost.

The foregoing constitute the chief items of overhead and the problem now arises of their proper distribution over the product.

There are three main methods of distributing overhead:

1. Percentage of Direct Labour.
2. Productive Hours.
3. Machine Rate Hours.

I might here point out that the method of arriving at the rate of overhead is not necessarily the same for all departments in the same factory. The Direct Labour method is the one most commonly employed perhaps because of its easy application. The point to be considered, however, is how far conditions warrant its use. The ideal conditions are, of course, when labour is the dominant factor in the cost and wages are comparatively equal. It can also be used where the machines in one department are of the same type, and are used on the same kind of work and the wages more or less the same.

The productive hour method is very similar to the foregoing, the difference being that instead of the wages paid to the employees, the total hours worked by them are taken. It is often an improvement over direct labour, especially if the bonus system of wages is in operation, where an increase in wages would naturally indicate an increase in production. The total overhead would remain practically the same, but the overhead per unit would be less. If overhead was distributed on a wages basis, however, it would mean that the same rate of overhead was being used on a greater production, and as production increased so would the charge for overhead.

When there are a large number of machines in operation, perhaps the most equitable method is by machine rate hour. Under it the total expense of each machine or group of similar machines for a certain period is taken—usually a year—and divided by the number of hours which the machine ran at normal capacity for the same period. This gives the amount to be charged per hour in respect of overhead on the product passing through the machine.

Two other methods of distributing overhead might be mentioned in passing, and these are direct material and prime cost. The treatment under these methods is obvious by the titles, and as they are very limited in their application I do not think it is necessary to dwell on them at any length.

An important feature under any distribution method is the unabsorbed overhead through the lessened production on account of poor business conditions. Overhead is based on normal production, and any divergence from the latter affects the former, with the result that the rate must be increased in order to insure the absorption of the total overhead or else the unabsorbed balance must be charged to Profit and Loss. To increase costs by additional overhead to the normal does not appear to me to be sound and would tend to further restrict production on the ground that goods can no longer be sold at

a profit. I do not think it can be argued that customers should pay a higher price when business is poor simply because the manufacturer requires it in order to operate at a profit. One can conceive of a condition where only one machine in each department is employed on one order. Is it reasonable to assume that the total overhead for the whole plant for that period should be charged to that job? I think not.

Control

I said at the beginning that in order to be successful a cost system must tie up with the financial records. How this is done and the number of accounts which are kept of course depends upon the class of business, and so, I think, need not be discussed here. Usually a factory ledger is kept in which are detailed all the operating asset and expense accounts, which is controlled by one account in the general ledger. It may be, of course, that the size or class of business does not warrant a separate cost ledger, in which case the various accounts would be carried in the general ledger.

In concluding this short and somewhat rambling talk, might I emphasize once more the importance of accurate costs records and the necessity of placing the information they convey before the parties interested with as little delay as possible.

INTERNATIONAL CONGRESS ON ACCOUNTING

AMONG our members who attended the International Congress on Accounting, held in New York in September, were: A. A. Gowan, C.A., Montreal; H. E. Guilfoyle, F.C.A., Toronto; H. P. Edwards, C.A., Toronto; G. A. Peters, C.A., Toronto; James Turner, C.A., Toronto; S. E. LeBrocq, Hamilton; W. J. McDonald, C.A., Winnipeg.

The courtesies extended to these members are appreciated by the Society.

PERSONAL MENTION

H. Perrin, formerly of Clarkson, Gordon, Dilworth, Guilfoyle & Nash, Toronto, is now with O'Donnell, Mackie, Ltd., automobile distributors, Toronto.

Stan. R. Bates, representing International Business Machines, Ltd., tabulating division, in Hamilton, has been moved to Winnipeg by his company.

H. K. S. Hemming, C.G.A., C.P.A., of Montreal, is one of a committee appointed by the Province of Quebec Safety League to examine the question of premiums levied upon liability and accident insurance and inspection.

COST LITERATURE

COSTS in Airplane Construction and Transportation. C. Roy Keys, vice-president, Curtiss Aeroplane & Motor Company, Inc., Buffalo. National Association of Cost Accountants' Bulletin, Aug. 1, 1929.

Distribution of Selling and Administrative Expenses. J. F. Lovell, the Norton Company, Worcester, Mass. National Association of Cost Accountants' Bulletin, Aug. 1, 1929.

The Depreciation Element in Burden Estimates. Prof. John B. Canning, Associate Professor of Economics, Stanford University, Cal. National Association of Cost Accountants' Bulletin, Sept. 1, 1929.

Labour Costs in the Building Industry, Their Compilation and Distribution. S. Walter Johnson, assistant treasurer, Turner Construction Co., Philadelphia. National Association of Cost Accountants' Bulletin, Sept. 1, 1929.

Accounting for Dairy Products. H. H. Neel, secretary, D. H. Ewing's Sons, Louisville, Ky. National Association of Cost Accountants' Bulletin, Sept. 15, 1929.

Developing Labour Costs in the Textile Industry. Clinton W. Bennett, Cooley & Marvin Co., Providence, R.I. National Association of Cost Accountants Bulletin, Sept. 15, 1929.

The Costing of Chemical Manufacturing Processes. L. Staniforth, A.C.W.A. The Cost Accountant, June, 1929.

Motor-Car Costing. H. E. Hyatt, A.C.W.A. The Cost Accountant, June, 1929.

Work-shop Efficiency with Special Reference to Output. S. N. Fisher. The Cost Accountant, June, 1929.

Waste in Industry Due to Careless Factory Storekeeping. J. W. Moorin. The Cost Accountant, July, 1929.

Methods of Costing for Motor Road Transport. A. E. Irwin. The Cost Accountant, July, 1929.

Highway Costing. E. N. Judge. The Cost Accountant, August, 1929.

Cost Accounting in Foundry Practice. J. O. Gray, A.C.W.A. The Cost Accountant, August, 1929.

Less Waste and Higher Efficiency. C. W. Brett. The Cost Accountant, August, 1929.

Merchandise Turnover. Caddie H. Kinard. The Journal of Accountancy. July, 1929.

Interdepartmental Profits. Eric A. Camman. The Journal of Accountancy, July, 1929.

Motor-bus Accounting. A. F. Wagner. The Journal of Accountancy, August, 1929.

Accruing Pensions as a Part of Current Operating Cost. Ingalls Kimball. The Journal of Accountancy, Sept., 1929.

Phases of Budgetary Control. Frank S. Hecox. The Journal of Accountancy, New York, Sept., 1929.

Differential Costs. T. W. Leland, C.P.A. The Certified Public Accountant, July, 1929.

COST LITERATURE

The Use of Statistical Methods in Accounting. Lawrence G. Macpherson, B.A. The Canadian Chartered Accountant, Sept., 1929.

Form for Figuring Costs of Sales. H. E. L. Green, Washburn Company, Rockford, Ill. The American Accountant, Aug., 1929.

Form used in Analyzing Process of Various Operations. H. R. Lawrence, Hamilton Watch Co., Lancaster, Pa. The American Accountant, August, 1929.

Does Depreciation on Appreciation Belong in Costs? Dana R. Hanford. The American Accountant, Sept., 1929.

Form for Summarizing Costs of Finished Jobs. W. L. Weifenbach, Durant Manufacturing Co., Milwaukee. The American Accountant, Sept., 1929.

Form for Gathering Costs of Finished Parts. H. B. Graham, Mattison Machine Works, Rockford, Ill. The American Accountant, Sept., 1929.

Classifying and Recording Spoilage Losses. H. E. Simmons, Anderson Bros. Mfg. Co., Rockford, Ill. The American Accountant, Sept., 1929.

Stock-Record Card for Keeping Perpetual Inventory. E. H. Odell, Cotta Transmission Corporation, Rockford, Ill.

Costing System for Motor Transport. T. H. Hargrave. The Accountants' Magazine, Aug., 1929.

Publication of Cost Statistics. Philip C. Palmer. The Accountants Journal, Aug., 1929.

Administration of a Modern Factory. Victor G. Winslet, A.S.A.A. The Accountants Journal, Aug., 1929.

Depreciation for Costing. E. G. M. Phillips. The Accountants' Journal (New Zealand), June, 1929.

Rationalization and Standard Costing. The Accountant, Aug. 10.

NEW MEMBERS

The following are new members of the Society:

Toronto

*Scott, W. W., National Cash Register Co., Ltd. (replacing J. J. Beacham, who is moved to another position).
Glaser, A. E., Crown Cork and Seal Company, Ltd., Toronto.

Montreal

Cotnam, H. A., C.A., Coulter & Jones, Montreal.
Fitzgerald, G. H., Greenshields, Ltd., Montreal.
Cartlidge, F., H. Simon & Sons, Ltd., Montreal.
Probyn, P., C.A., Sherwin-Williams Co. of Canada, Ltd., Montreal.

Hamilton

*Hammond, J. W., Hamilton Hydro-Electric Power Commission (replacing N. O. T. Smith).

*Junior membership.

PRIZES FOR 1929-30 SEASON

THE Society now has in hand $80 donated for prizes, which the directors offer in the form of three prizes of $40, $25 and $15 respectively, for the three best original papers given during the 1929-30 season by members not over the age of 25 years (i.e., who has not reached his 26th birthday), on any subject within the field of the Society.

This is a splendid opportunity for the younger members of the Society to come forward and earn valuable prizes for papers presented. The Chapter chairman will be glad to arrange for the presentation of such papers. They must also be available for printing in Cost and Management.

There is also a prize of $25 for the Chapter secretary best reporting Chapter activities during the 1929-30 season.

The directors of the Society have appointed a committee to award these prizes.

For these gifts the Society is indebted to one of its members, who desires to remain anonymous.

THE TREND OF PRODUCTION COSTS

COMMODITY prices went slightly higher in August, the Dominion Bureau of Statistics index number, based on 502 commodities with 1926 as the base period, going up from 96.0 in July to 98.1 in August. The following is a summary of the figures:—

	August 1928	July 1929	August 1929
Food, beverages and tobacco	101.5	99.1	103.4
Other consumers' goods	92.7	91.3	91.1
All consumers' goods	96.2	94.4	96.0
Producers' equipment	92.8	94.9	94.9
Producers' materials	94.4	101.2	100.9
Building and construction materials	98.1	99.1	99.8
Manufacturers' materials	93.4	101.7	101.2
All producers' goods	94.2	100.6	100.3
All commodities	95.4	96.0	98.1

The most important advances were in the following: Fresh foreign fruits and dried fruits; flour and milled products; bakery products; vegetable oils; sugar and its products and glucose; vegetables, eggs and organic chemicals. The most important decreases were in the following: Canned fruits; rubber and its products; leather; live stock, and wool cloth.

The number of strikes and lockouts in Canada in August was ten, of which four had been carried over from July, and six started during August. Six were terminated during the month. The four

carried over into September were as follows: Shoe factory workers, Toronto (commenced April, 1929); printing compositors, Nelson, B.C. (commenced July, 1929), moulders, Montreal (commenced May, 1929); coal miners, New Waterford, N.S. (commenced August, 1929). None of these are general enough to materially affect costs.

Money rates continue unusually high.

FINANCIAL STATEMENT
OF
THE CANADIAN SOCIETY OF COST ACCOUNTANTS

For Year Ended February 28, 1929

BALANCE SHEET
As at February 28, 1929.

Assets

Cash in bank	$2,184.89

Liabilities

Membership fees received in advance		$ 670.00
Trust account, donation for prizes not expended		40.00
Surplus, March 1, 1928	$ 438.96	
Year ended Feb. 28, 1929	1,035.93	
		1,474.89
		$2,184.89

Examined and found correct.

FRED PAGE HIGGINS, F.C.A.
C. H. PELLING, C.A.

REVENUE AND EXPENDITURE
As at February 28, 1929

Revenue

Membership fees		$5,365.50
Interest and exchange		.80
		$5,366.30

Expenditure

General expense		$1,699.81
Chapters		1,050.30
Publications—Revenue	$ 46.50	
Expenditure	1,601.61	
		1,555.11
Interest and exchange		25.15
		$4,330.37
Add surplus for year ended February 28, 1929		1,035.93
		$5,366.30

Costing System for Motor Transport

By T. H. HARGRAVE

(From The Accountants' Magazine, Edinburgh.)

IN discussing the question of costing methods, as applied to motor transport, it will be appreciated that the subject is important not only to the manufacturer who uses this means for delivering his products, but also to motor transport contractors. To the former, a true knowledge of his transport costs is desirable, so that his varied output may be correctly charged with this item of expense, whilst to the latter it is indispensable if they are to meet successfully the keen competition of to-day. Whilst the system described herein is that adopted by a large firm of motor hauliers, no reason exists why in a modified way it should not be used by any concern having a fleet of such vehicles.

In the first place, what are the items to be taken into account in arriving at the cost of running a fleet of lorries? They may be divided into three main sections: (1) direct expense—*i.e.*, wages of drivers, helpers, loaders; (2) operating expense—*i.e.*, petrol, oil, tires, repairs and maintenance; and (3) overhead expense. Under this latter heading is included all expenditure by way of interest, depreciation of vehicles, license fees, garage expenses, insurance administrative costs, etc.

In much the same way as railway charges are made up on the basis of the ton mile, so also in like manner is it usual to charge for motor transport. Now what is the ton mile, and how can we measure the work which any vehicle does? If we examine this question more closely we shall see that there are three factors to be considered —namely, speed, distance and load. Suppose we have two vans of equal load-carrying capacity, but one capable of travelling twice as fast as the other, it is clear that given equal conditions, the faster vehicle will deliver two loads while the other is delivering one. Similarly, if both vans have the same speed, but one can carry twice the load of the other, the bigger capacity van will deliver twice as much goods as the other. Now, if instead of speed we substitute the term distance, we get the formula—

$$\text{Distance} \times \text{Load} = \text{Work done.}$$

Considering the distance as miles and the load in tons, we arrive at the ton mile. Ton mileage is therefore the product of the weight carried in tons and the distance hauled in miles, and it is this which forms the basis on which the major portion of the costs of haulage are calculated.

In ascertaining the cost of running any vehicle we must first arrive at the amount of overhead expense chargeable for each working day. Deducting the 52 Sundays and also an allowance for periods when the van is out of commission for repairs, we can safely base on not more than 300 working days per annum. Certain of the overhead expenses such as interest, depreciation, licenses, etc., can be and

are allocated to the particular van in respect of which they are incurred. Other portions such as administration, garage, expense, etc., are spread equally over the total number of vehicles.

Overhead expenses, which in the main accrue irrespective of the time worked, mileage or weight carried, form the only exception to the ton-mileage basis, and they are undoubtedly more easily and correctly applied by reducing them to a charge per lorry per days available. So far as operating expense (sec. 2) is concerned, annual figures are used, these being obtained from records taken relative to each vehicle, and divided by the total number of ton miles in that period. Shorter periods than this were not considered reasonable—in view of fluctuations—to form a reliable basis, and, in fact, over the longer period, and comparing several years one with the other, comparatively little variation was observed.

For the purpose of recording work done, use is made of a driver's card, shown at Fig. 1, ruled so as to give all particulars as to distance travelled, weight carried, and the amount of petrol and oil consumed. Space is also provided for a report by the driver as to any defects requiring attention and as to spare parts used. A second card for the use of the garage manager—shown at Fig. 2—summarizes the particulars taken from the driver's card, and is made up monthly. On the reverse side provision is made for recording the overhead expense on the basis previously outlined.

At the end of the month—since it is obviously unnecessary to obtain costs for each journey, or even for each day—the No. 2 card is totalled and passed to the accountant. The figures are then transferred to a ledger having a separate account for each vehicle. By this means, what may be called a profit and loss account is prepared for each individual lorry, a copy being handed to the garage manager. He can thus see at a glance what his various units are earning for him, and in the event of any vehicle losing money, he gets a chance of employing it differently before the loss grows to any serious extent.

Turning aside for a moment from the question of costs, an important factor in the efficient running of any transport business is the provision of an adequate supply of spare parts for use not only in ordinary maintenance, but in cases of breakdown. The precise stocks that were kept on hand were determined from the experience of actual running of the vans in service, the data being collected from the space provided on the driver's card. Maximum and minimum quantities were decided on, and instructions given to place repeat orders immediately the stock of any particular spare came below the minimum quantity. A portion of the premises was partitioned off and a series of bins fitted up. Each bin was provided on the front with a bin card on which was recorded firstly the maximum and minimum quantities of that particular item to be kept in stock. Columns were also provided for recording entries of stocks received and issued, together with dates, and a final column shows the stock in hand. The precise position relative to stocks can therefore be ascertained at any time by a glance at the stock on hand and comparing it with the minimum as laid down.

Reverting again to the question of costs, the data as compiled is not only used for showing the state of business, but also for quoting purposes. Thus in the event of an inquiry being received for trans-

DRIVER'S CARD

NAME VAN No. DATE

Journey No.	Destination.	Miles.	Load.	Petrol.	Oil.
1					
2					
3					
4					
5					
6					

DRIVER'S REPORT:—

FIG. 1.

GARAGE MANAGER'S CARD

DRIVER VAN No. MONTH

Period	Total Mileage.	Load in Tons.	Total Ton Miles.	Petrol.	Oil.	Spares.
1st Week						
2nd "						
3rd "						
4th "						
5th "						
TOTALS						

FIG. 2.

port, the weight and distance being known, a very close estimate can be given as to the probable time that the job will take. From this we can arrive both at the wages cost and the overhead expense, and from the ton-mile rate for the vehicle concerned, the operating expense can be ascertained.

By way of example, the following particulars relative to a 3-ton van, collected over a twelve months' period, are given. In addition to the expenses shown, overhead expense to the sum of £64 was charged against it.

VAN No. 15.		TON-MILEAGE 37550.			Year.....		
Wages.	Fuel.	Oil.	Tires	Repairs.	Interest.	Depreciation.	Licenses.
£ 245	£ 64	£ 8	£ 37	£ 66	£ 12	£ 150	£ 35

On a ton-mileage basis it will be seen that the gross costs amounted to £245 + 64 + 8 + 37 + 66, or £420, equal to a charge of 2.69 pence per ton mile. The daily charge—allowing 300 days per year—amounted to £12 + 150 + 35 + 64, or £261, or 17s. 5d. per day. In submitting any quotation, therefore, according to the time estimated to be taken, a charge of 17s. 5d. per day was made, whilst for each ton mile the load was carried, 2.69 pence was charged, these two figures, of course, being subject to additions for profit.

CHAPTER NOTES

MONTREAL

The address of Hon. James A. Robb, Minister of Finance, given at the Montreal Chapter Dinner on October 3rd, was a fitting opening to a session which is of unusual promise.

In addition to the regular fortnightly meetings, the Chapter is co-operating with the Montreal Board of Trade and McGill University, in putting on "Courses in Commercial Education." These Courses have created an encouraging response among the young men of Montreal and should fill the need of an ever increasing number, as they become more firmly established.

The Roster of Speakers for the regular meetings of the Session includes the names of men who can speak with authority on topics relative to Cost Accountancy and Industrial Management. Several speakers from outside points are kindly co-operating with us at considerable personal inconvenience, as well as men prominent in Professional and Commercial affairs in Montreal.

The subject which is being dealt with by the various Chapters throughout the Society—"The Tie-In of the Factory Records with the Cost Accounts"—is being dealt with by Mr. Oliver Wellington, C.P.A., of Scovell, Wellington & Company, Boston.

Professor J. A. Coote, B.Sc., of the Faculty of Applied Science, McGill University, has undertaken a series of three on "Charts and Graphics in Relation to Cost Accounting." Professor Coote has spoken to us before and his subject should provoke considerable thought on the part of the members under his able guidance.

One feature of the programme is the reservation of an evening for the presentation of papers by younger members, and for the discussion of problems to be presented by the students in the Commercial Courses.

The programs of the chapters of the Society will be given in detail in November Cost and Management.
